# How Discards Are Calculated for Groundfish Sectors and the Common Pool

NOAA Fisheries/Northeast Regional Office/Fisheries Statistics Office

During fishing operations, fish are occasionally discarded at sea. The amount of the discarded fish must be determined so that it can be subtracted from the Annual Catch Entitlement (ACE) of the sector or the common-pool. Both sectors and the common pool need this information so that they don't exceed their ACEs. Otherwise the ACE would have to be reduced accordingly in the next fishing year. NOAA Fisheries Service and the New England Fisheries Management Council (NEFMC) also need this information to monitor overall catch rates and to set annual catch limits. The way that discards are calculated depends on whether the fishing trips are observed or unobserved.

## Discards for Observed Trips

- If 100% of the hauls are observed, the actual observed discards are applied to the trip. Landings + discards = total catch for the trip.
- If less than 100% of the hauls are observed, the discards from the observed hauls are used to estimate the amount of discards for the unobserved hauls.

## Discards for Unobserved Trips

Discards are estimated for trips that are not observed. The discard estimation process is performed at the stratum level. A *stratum* is made up of trips by members of the same sector, or members of the common pool, with the same gear type/mesh and in the same stock area. In other words, a stratum is a way of grouping similar trips.

### *Discard Ratio*

The basis for calculating discards on unobserved trips is the ratio of discards-to-total landings from observed trips within a stratum. This is called the *discard ratio*. (A *ratio* compares the size, or magnitude, of two quantities.) For example, suppose there were on observed trips within the stratum 100 pounds of discards out of a landings total of 10,000 pounds. The discard ratio would be:

100/10000 = 1/100 = 0.01

### *Cumulative Method*

NOAA Fisheries Service employs a *cumulative* method of estimating discards. This means that as more data are reported during the fishing year, discards are re-estimated with updated discard ratios using the most current year-to-date totals. (You'll see an example of this later in the section Example: NOAA Fisheries Service Computes the Discard Ratio.)

The method to determine the discard ratio for unobserved trips is one of the following:

- Assumed
- Transition
- In-season

The method is determined by how many observed trips have occurred, as explained in the following sections.

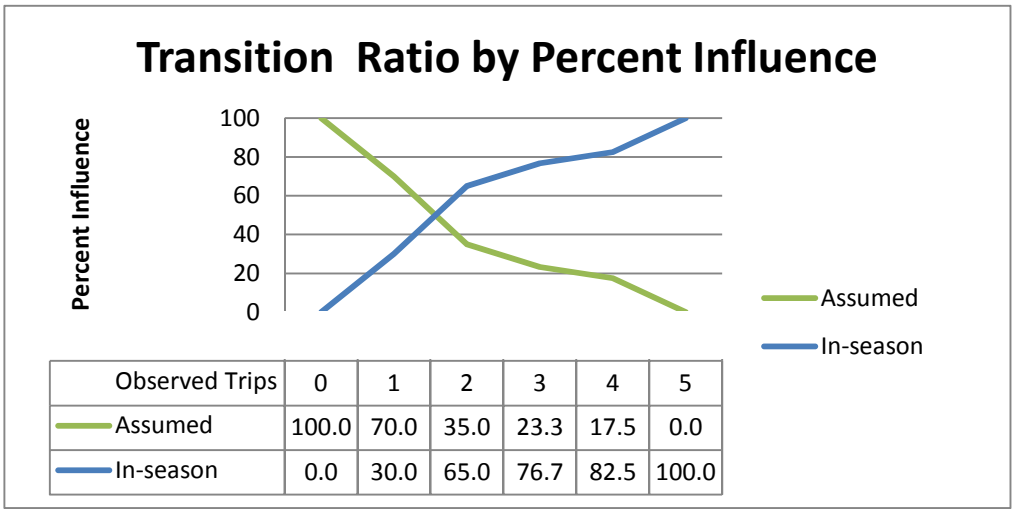
### *Assumed Discard Ratio*

At the beginning of the fishing year, no observed trips have occurred. Therefore, NOAA Fisheries Service provides an assumed discard ratio. This is based on observer data from one or more previous years for the same gear and stock. For fishing year (FY) 2010, observer data from FY 2008 – 2009 were used.

### *Transition Discard Ratio*

For the first four observed trips within a stratum in the fishing year, NOAA Fisheries Service provides a transition discard ratio. After each observed trip, the transition ratio diminishes the influence of the assumed discard ratio in the calculation of discards for that stratum. After four trips have been completed in the stratum, the in-season ratio replaces the assumed and transition ratios. See Figure 1 for an illustration of the decreasing weight given to the assumed discard ratio as observed trips accumulate.

**Figure 1: Influence of Assumed and In-season discard ratios on the Transition discard ratio**




| Observed Trips | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Assumed | 100.0 | 70.0 | 35.0 | 23.3 | 17.5 | 0.0 |
| In-season | 0.0 | 30.0 | 65.0 | 76.7 | 82.5 | 100.0 |

### *In-Season Discard Ratio*

Starting at the fifth observed trip in a stratum, NOAA Fisheries Service changes the method to the in-season ratio. This ratio uses discard data from observed trips to estimate discards from unobserved trips. As more observer data become available, NOAA Fisheries Service updates the in-season discard ratio and applies it to all unobserved trips within that stratum during the fishing year.

# Understanding the In-Season Discard Ratio

Determining discards from unobserved trips using the in-season discard ratio is a two-step process:

1. Computing the discard ratio for the sector, stock area, and gear/mesh
2. Applying the discard ratio

## Computing the Discard Ratio

NOAA Fisheries Service does this part. It uses the observed trips to estimate the discards from all unobserved trips in a stratum. NOAA produces each in-season discard ratio, one per stratum, and then provides the ratios in the Sector Information Management Module (SIMM) download file **Discardrate**. The discard ratio is $d/k_{all}$.

- $d$ = Year-to-date observed discards for a stock from observed trips
- $k_{all}$ = Year-to-date landings of all species from observed trips

Refer to the example described earlier in the section Discard Ratio for a simple example of this ratio.

## Applying the Discard Ratio

Once the discard ratio is computed, it can be applied. Following is the method to do this:

*Landings * Discard Ratio = Discards*

where:

- *Landings* = total landings of all species from unobserved trips
- *Discards* = discards for unobserved trips in the stratum

Sector managers get the discard ratios from SIMM and apply the discard ratio to the trip landings of all species information that they get from dealers. For common pool operations, NOAA Fisheries Service applies the discard ratios. See the section Examples: Applying the In-season Discard Ratio for more information.

## Key Concepts

Keep the following in mind about discards:

- Discard ratios are *shared* across the sector or the common pool. The observed discard patterns of all the vessels in a sector, for example, determine the discard ratios for that sector. All vessels in the sector then share those discard ratios when their discards are computed. This means permit holders can be charged for discards on unobserved trips, whether a particular stock was caught on a trip or not.
- Discard ratios are computed at the sector level and applied at the trip level.
- The sector manager can summarize total discards any number of ways, including by trip, by permit, or by sector, according to the data management needs of the sector.
- The sum of discards from a sector's observed and unobserved trips equal sector-level discards.

## Examples: Applying the In-season Discard Ratio

The remainder of this section shows examples of applying the in-season discard ratio. This section illustrates sector operations, but the same method would apply to the common pool. NOAA Fisheries uses this cumulative process throughout the fishing year to refine the discard ratio.

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**Note:** If there are no discards in the stratum for the reporting period, the discard ratio is zero, which must be applied.

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### *Example: NOAA Fisheries Service Computes the Discard Ratio*

Read this section to see how the cumulative method changes the discard ratio from week-to-week. The example shows the first two weeks, but the process is same throughout the fishing year.

Table 1 shows how NOAA Fisheries prepares the discard ratio for a particular stratum in Week 1:

1. Sums the observed Trip Discards from Week 1 (27+128+23+50+120 = 348 lb).
2. Sums the observed Trip Landings from Week 1 (5600+4500+3800+6700+4200 = 24,800 lb).
3. Divides 348 by 24,800 = 0.0140.

**Table 1: Computing the Discard Ratio, Week 1 (NOAA Fisheries Service)**

| Observed Trips in the Stratum (Sector/Stock Area/Gear) | | | | | | |
|---|---|---|---|---|---|---|
| Trip | Week | Trip Data | | | Year-to-date (updated weekly) | |
| | | Observed Trip Discards (lb) | Trip Landings of all species (lb) | Observed Discards, d (lb) | Landings all species, kall (lb) | Discard ratio (d/kall) |
| O1 | 1 | 27 | 5600 | | | |
| O2 | 1 | 128 | 4500 | | | |
| O3 | 1 | 23 | 3800 | | | |
| O4 | 1 | 50 | 6700 | | | |
| O5 | 1 | 120 | 4200 | | | |
| Week 1 Summary | | 348 | 24800 → | 348 | 24800 | 0.0140 |

Table 2 shows how NOAA Fisheries prepares the discard ratio for a particular stratum in Week 2.

1. Sums the Trip Discards from Weeks 1 and 2 (348 + 155 = 503 lb).
2. Sums the Trip Landings from Weeks 1 and 2 (24,800 + 3870 = 28,670 lb).
3. Divides 503 by 28670 (= 0.0175).

**Table 2: Computing the Discard Ratio, Week 2 (NOAA Fisheries Service)**

| Observed Trips in the Stratum (Sector/Stock Area/Gear) | | | | | | |
|---|---|---|---|---|---|---|
| Trip | Week | Trip | | Year-to-date (updated weekly) | | |
| | | Observed Trip Discards (lb) | Trip Landings of all species (lb) | Observed Discards, d (lb) | Landings all species, kall (lb) | Discard ratio (d/kall) |
| O1 | 1 | 27 | 5600 | | | |
| O2 | 1 | 128 | 4500 | | | |
| O3 | 1 | 23 | 3800 | | | |
| O4 | 1 | 50 | 6700 | | | |
| O5 | 1 | 120 | 4200 | | | |
| Week 1 Summary | | 348 | 24800 → | 348 | 24800 | |
| O6 | 2 | 155 | 3870 | | | |
| Week 2 Summary | | 155 | 3870 → | 155 | 3870 | |
| | | | | 503 | 28670 | 0.0175 |

*Example: Sector Manager Applies Discard Ratios*

Table 3 shows the discard ratio applied in Week 1. Remember the formula to apply the discard ratio is:

*Landings* * *Discard Ratio* = *Discards*

In Table 3, apply the discard ratio to each unobserved trip landings total in the stratum in Week 1. (For example: 6200 lb * 0.0140 = 87.0 lb)

**Table 3: Applying the Discard Ratio (Week 1)**

| Unobserved trips in the Stratum (Sector/Stock Area/Gear) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trip | Week | Trip landings, (lb) | Discards calculated in Week 1 | | Discards calculated in Week 2 | | Discards calculated in Week 3 | | Discards calculated in Week 4 | | |
| | | | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | |
| U1 | 1 | 6200 | 0.0140 | 87.0 | | | | | | | |
| U2 | 1 | 4890 | | 68.6 | | | | | | | |
| U3 | 1 | 8210 | | 115.2 | | | | | | | |
| Year-to-date discards for **unobserved** Sector trips | | | | **270.8** | | | | | | | |

Table 4 shows the discard ratio applied in Weeks 1 and 2. Notice that the discard ratio updated in Week 2 has increased, changing the discard totals from Week 1 as well (for example, 6200 lb * 0.0175 = 108.8 lb of discards):

**Table 4: Applying Discard Ratio (Week 2)**

| Unobserved trips in the Stratum (Sector/Stock Area/Gear) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Trip | Week | Trip landings, (lb) | Discards calculated in Week 1 | | Discards calculated in Week 2 | | Discards calculated in Week 3 | | Discards calculated in Week 4 | | |
| | | | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | |
| U1 | 1 | 6200 | 0.0140 | 87.0 | 0.0175 | 108.8 | | | | | |
| U2 | 1 | 4890 | | 68.6 | | 85.8 | | | | | |
| U3 | 1 | 8210 | | 115.2 | | 144.0 | | | | | |
| U4 | 2 | 4525 | | | | 79.4 | | | | | |
| U5 | 2 | 3896 | | | | 68.4 | | | | | |
| U6 | 2 | 5320 | | | | 93.3 | | | | | |
| Year-to-date discards for **unobserved** Sector trips | | | | 270.8 | | **578.2** | | | | | |

Table 5 shows the discard ratio applied in Weeks 1 through 3. Notice that the discard ratio updated in Week 3 has decreased, changing the discard totals from Weeks 1 and 2 as well (for example, 6200 lb * 0.0171 = 106.1 lb of discards). The discard ratio may move up or down from week to week but, as data accumulate, the ratio becomes more accurate as the fishing year progresses.

**Table 5: Applying Discard Ratio (Week 3)**

| Unobserved trips in the Stratum | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Trip | Week | Trip landings, Kall (lb) | Discards calculated in Week 1 | | Discards calculated in Week 2 | | Discards calculated in Week 3 | | Discards calculated in Week 4 | |
| | | | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) | Discard ratio | Trip discards, D (lb) |
| U1 | 1 | 6200 | 0.0140 | 87.0 | 0.0175 | 108.8 | 0.0171 | 106.1 | | |
| U2 | 1 | 4890 | | 68.6 | | 85.8 | | 83.6 | | |
| U3 | 1 | 8210 | | 115.2 | | 144.0 | | 104.4 | | |
| U4 | 2 | 4525 | | | | 79.4 | | 77.4 | | |
| U5 | 2 | 3896 | | | | 68.4 | | 66.6 | | |
| U6 | 2 | 5320 | | | | 93.3 | | 91.0 | | |
| U7 | 3 | 6530 | | | | | | 111.7 | | |
| U8 | 3 | 4800 | | | | | | 82.1 | | |
| U9 | 3 | 5400 | | | | | | 92.4 | | |
| Year-to-date discards for **unobserved** Sector trips | | | | 270.8 | | 578.2 | | **851.3** | | |